

that the Flames rolled down Stairs. The Clap of *Thunder* which immediately followed seemed to all like the suddain Discharge of five or six Field-pieces, not with that rolling, deep noise *Thunder* usually carries along with it: Indeed, for my part, I thought it had been Guns. The Second Flash and Clap followed within a few Minutes of the first, but not with that Violence as the former: Which Flash fir'd the *Steeple* I cannot say, but a piece of Wood to which the Lead of the Windows was nailed (the Windows being nothing but Lead cut full of Holes) was set on fire, and kindled very fast, and might have done a great deal of Mischief, had not the earliness of the Night, and timely help prevented it. This Storm seemed to run in a direct Course; for several of our side-Towns perceived little of it; and I believe it broke chiefly over us, for I hear of no Effects it had any where else, but only at *Kettering*, where one of their Bells, as some say, received some damage, and the Wires of the Chimes were twisted one within another: The Wind was very blustering all the Night after.

Oundle, Apr. 22.
1693.

Tours, &c.

VI. *Anatomical Observations in the Heads of Fowl made at several times. By the late Allen Moulen, M. D. S.R.S. Read before the Royal Society, Feb. 1. 1687.*

I. **I**N the Heads of all the Fowl that I had an opportunity to examine, I constantly found only one *Aquæductus*, or Passage from the Ears into the Pallat; whereas

Whereas in Men, Quadrupedes, and some Amphibious Fish, there are always two, one on each side below the Entrance of the Nostrils into the Pallat, and opening towards the Nostrils, for the more convenient reception of Air, as is supposed. This Passage in Fowl is exactly in the middle of the Pallat, below the entrance of the Nostrils into it: It is a membranous Tube, capable of admitting a Ravens, if not a Goose Quill in larger Fowl, such as Turkeys, Geese, &c. and reaches backward as far as the Communication from Ear to Ear, and hence it comes to serve both; whereas there is a necessity of two in those Animals, whose Ears do not communicate.

2. I have purposely examined the Heads of all the Species of Fowl I could procure, and constantly found a hollow space between the two Tables between the *Os Guneiforme* reaching from Ear to Ear, and as far forward as the aforesaid common *Aquæductus*, or rather *Ductus Aereus*, the contrivance of it seeming more to favour this than the former use. This Cavity in all Fowl (as far as I have observ'd) reaches above the *Labyrinthus* on each side, so that whatever impulse is made on the *Tympanum* on the one side, may not only be very readily communicated by means of the internal Air to the *Labyrinthus* of the same, but also to that of the opposite side. Hence probably proceeds the quickness of Hearing and Vigilancy of Fowl, notwithstanding their wanting a *Cochlea*, the defect of which seems to be by this Structure more than supplied, no other Creatures that we know of having any thing of it. It is not improbable that the opposite Ear to a Sound is altogether as much affected by it as that next it, if not more. There are several *Laminulæ* and Pillars of hard Bone between the two Tables in these Cavities, designed, as may be supposed, partly for their Maintenance at a convenient distance, and partly for breaking of the Air, so as to hinder Echoes

choes and confus'd representations of Objects. In confirmation of which last Reason Sir *John Hoskins* did ingeniously observe, that Pillars in Churches very much prevented Ecchoes : And for the same reason these might also hinder them in the Heads of this particular Structure.

3. In the Heads of *Woodcocks*, besides the passages now describ'd, I found one on each side the Bone, making the Orbit of the Eye proceeding from the Ear, and reaching forward towards the setting on of the Beak, near which they join'd in one, and turn'd under the Skull in a small passage leading to the Cavity, by which the Ears communicate, and which is above describ'd, into which it enters. These passages are also in the Heads of *Snites* ; and moreover, one over the *Sinus Longitudinalis*, and another over the *Sinus Lateralis* of the Brain. Note, that in the killing of *Snites* and smaller Birds, if care be not taken that the Head be not bruis'd, these passages cannot be discover'd for Blood extravasated in them. Note also, that the *Laminulae* and bony Pillars are every where to be observ'd where there is a passage, excepting under the Skull, in the passage from the setting of the Bill to the first passage describ'd.

4. In the Heads of *Parrots* and *Paroquets*, besides the first describ'd passage, I observ'd between the two Tables every where Cells opening into others, and those into others, so that there was not any part scarcely of the Skull that was not taken up with them. And this did not only appear by pouring into one Ear freed from its Drum, the other also being removed, a Tincture of Cochineal, and then blowing of it into all these Cells, so that no part was free from Tincture, but it appeared also to the naked Eye, notwithstanding that sometimes it was difficult to trace the Communications of them by reason of numerousness of the *Laminulae* and Pillars aforesaid.

5. In Singing Birds the Structure of these passages is like that of the *Parrot* and *Paroquett*, only that the Pillars and *Laminulae* are less than they should seem to be in proportion to the Heads. From whence it is probable, that these Birds are by this Structure enabled to distinguish Sounds and Notes, and also imitate them better, having a more musical Ear.

6. In the Heads of *Pullets*, *Geese* and *Ducks* I found only the first describ'd passage distinctly, but in *Pluvers*, *Bustards*, and some other, I found another that went over the *Sinus Lateralis* of the Brain from Ear to Ear. This seems to be design'd to make them more watchful than Domestick Fowl, or yet those that live much on the Water, because they are liable to a great many Dangers that the others are exempt from. Note, that there are for the most part great varieties in the Structures of all Fowls Heads.

7. In the Ears of all the Fowl that I could examine, I never found any more than one Bone and a Cartilage, making a Joint with it that was easily moveable. The Cartilage had generally an Epiphise or two, one on each side, which were very flexible, as it self was. The Bone was small and very hard, having at the end of it a broad Plate of the same Substance very thin, upon which it rested as on its *Basis*. I got that of a *Pullets* Ear, represented in *Fig. 4.* where *a* is the main *Cartilage*, and *b b* the two *Epiphyses*, *c* the small Bone, and *d* the *Basis* or broad end of it. Note, that in the Figure, part of the Drum sticking to it is represented together with the Cartilages.

8. I observ'd three pair of *Nerves* in all the broad bill'd Birds that I could meet with, and in all such as feel for their Food out of their sight, as *Snites*, *Woodcocks*, *Curlews*, *Geese*, *Ducks*, *Teale*, *Widgeon*, &c. These *Nerves* are very large, equalling almost the *Optick Nerve* in thickness; they begin a little more forward than the
Auditory

Auditory Nerve from a little Protuberance which seems to be made for them: One of them goes over the *Optick Nerve* in the Orbit of the Eye, the other two go under the Eye. Two are distributed nigh the end of the upper Bill, and are there very much expanded, passing through the Bone into the Membrane, lining the Roof of the Mouth. The third Pair is distributed near the end of the lower Bill, and subdivided like the former. Note, that Birds that pick their Food where they can see it have not these *Nerves*, and that the Pair of Nerves belonging to the upper Bill is considerably smaller in proportion to the Fowls than those observ'd above; whence it is probable that these *Nerves* were designed for some great use, both on the account of their number and their largeness; and that the use to be assign'd to them must be to enable them to distinguish (whether by tasting or feeling I will not now distinguish) their Food, there being a necessity of a more exquisite Sense in these Fowl, than in any other. *Fig. 15.* represents these in a Ducks Head, where *a a* expresses the Edge of the *Cranium*, which was in part remov'd for the more clear view of these Nerves, *b b* are the *Cells* about the Ear between the two Tables above described, *c c* the *Brain* laid bare with its Blood-Vessels, *d d d* the three *Nerves* on one side, *e* the *Optick Nerve*, *f f f* the Skin and part of the Bone remov'd to bring the Nerve in view, *g g* the two Nerves expanded near the end of the upper Bill, *h h* that in the lower.

9. All the *Eyes* of Fowl and of *Fish* that I have examined were more or less *cartilaginous*; for the *Sclerotis* is a *Cartilago sui generis*, especially near the *Cornea* in all these Animals. And in the larger sorts of both I remembered to have found the whole *Sclerotis* such a kind of a *Cartilage*.

10. In the Eyes of Fish I observ'd that the *Processus Ciliaris* is not fastned to the joining of the *Cornea* & *Sclerotis*, as in all other Animals that I dissected, so as to hinder the watery Humour to go any further backward. For I constantly observ'd that the *Humor Ciqueus* may move a good way backward in some, and in others almost as far as the *Optick Nerve*. I shall at another time make some Remarks on this.

11. I have in as many *Fish* as I could conveniently examine carefully, found a Membrane which cover'd the *Tunica Cornea*, so as not to let any Water come to it. This answers the *Membrana Nictitans* in Fowl, and reaches on all sides to the *Cutis* of the Fish to which it is fastned; this is transparent, and pretty thin, and so is also the *Cornea*, if compar'd to that of the *Quadrupeds*.

12. I have frequently observ'd in smaller Fowl, that the Membrane of the *Drum* was double; for I have by gently pulling away the Membrane lining the Tube of the *Ear*, I observ'd at the bottom of it a transparent Membrane, which at first I took to be the Membrane of the *Drum*, but upon Examination I found that the Membrane of the *Drum* was still entire and in its proper place. I have sometimes observed this in larger *Fowl*, in a *Seal*, and in some other Animals, and am apt to think from a case mentioned in *Du Verneyes* Book of the *Ear*, that it is so in Men; and if so, it is likely it may be so in most, if not in all Animals. The Observation was as followeth; A Person that was deaf for some time died, whose Ears Mr. *Du Verneye* examin'd, in order to find out the cause of his Deafness, which he found to be a thick Membrane growing in the *Ear* before the *Drum*, which hindred the Impulses in the Air to be communicated to it. Now I take it to be more likely that the Membrane should be double, and that the outward was preternaturally incrassated, then that a Membrane should grow in a place where the sides do not touch.

